One disadvantage of these types of speed control is a potential lack of environmental qualification data in accordance with IEEE 323,[73] and quality assurance programs in accordance with 10 CFR 50, Appendix B,[51] which are required for safety-related equipment. However, for non-nuclear-safety-related applications, these requirements do not apply and speed control is a possible option to consider.

5.6.3 PRESSURE CONTROL

Effluent air cleaning systems are typically controlled to vary the system flow rate to maintain building (or space) pressure. This is accomplished by maintaining constant supply airflow and varying exhaust flow by adjusting control dampers and inlet vanes, and through speed control similar to the techniques described in Section 5.6.2. Accurately sensing building pressure and outside air pressure is important for achieving a stable operating system. The sensing system should incorporate a "dead leg" to dampen the system reaction to wind gusts. Multiple outdoor and, if necessary, indoor sensors should be provided to obtain an average outside air pressure. To maintain a building at a negative pressure with respect to the lowest outside air pressure, the outdoor sensors should be located on each exposure. The system should then be designed to control flow based on the highest positive pressure sensed (the one that would result in the most infiltration

Sensors should be located with due consideration given to local pressure fluctuations, eddy currents, and the turbulence that can be experienced at building corners and roof edges. Chapter 14 of the *ASHRAE Handbook of Fundamentals* provides guidance on determining turbulent zones due to airflow around buildings. This information must be considered in locating the sensors.

5.6.4 QUALIFICATION AND TESTING

All instruments used in ESF nuclear safety air cleaning systems must be qualified for environmental and seismic conditions in accordance with ASME AG-1, Section IA,[63] IEEE 323,[73] and IEEE 344.[76]

All instruments and devices must be calibrated and tested in accordance with manufacturer's test procedures. In addition, all power wiring internal to control panels, except control or shielded cable, should be subjected to a high-potential test to demonstrate freedom from ground and correct wiring connections.

It is recommended that extensive onsite pre-operational testing be performed on all instrumentation and control systems associated with nuclear air cleaning systems prior to placing the systems in service. Pre-operational testing should be performed to confirm correct installation and design and to ensure correct operability of the control system and operated equipment. USNRC Regulatory Guides 1.68[77] and 1.68.3[78] provide guidance on what should be considered in pre-operational tests.

5.7 Other Considerations

5.7.1 Security

Ductwork, openings for intakes and exhaust stacks, and other types of building penetrations and pathways must be properly protected against security threats. Security measures for these openings and pathways are addressed in the facility security requirements.

5.7.2 ENERGY CONSERVATION

Specialized products and components for energy conservation may be appropriately used for the facility HVAC systems. In employing these components, care must be exercised to avoid using products that cannot be decontaminated or would otherwise limit the ability of the air cleaning systems to perform their design basis functions.

5.8 REFERENCES

1. *ASHRAE (*American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc.,), *2000 Systems and Equipment Handbook s,* Chap. 2, "Building Air Distribution," and Chap. 16, "Duct Construction," Atlanta, GA,. 2000.